Space Weather Forecast

Issued on Friday, 03 May 2024 at 12:12 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Further Moderate-class flares likely with a chance of Strong flares through the period. Minor-Moderate storm intervals are likely over the weekend with a slight chance of a strong storm.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity is at High levels, due to a strong flare at 03/0222UTC from an active region in the northeast, which also produced a further moderate flare at 03/0811UTC. A region in the southeast has also been active, producing two moderate flares in the past 24 hours. There are currently eight sunspot regions on the visible disc. Of these the two aforementioned regions, both with delta spots, are the most at active regions on the disc.

There are potentially three earth-directed CMEs (Coronal mass ejections) currently analysed in the forecast. One from a CME that left the sun on the 29 April and may have been responsible for yesterdays unexpected CME arrival, if it wasn't the source it may give a glancing blow Day 1 (3rd May). The second left the sun around 01/0600 UTC and is expected to give a glancing blow late Day 2 (4th May) or early Day 3 (5th May). Additionally an Earth directed CME associated with the strong flare at 03/0222UTC may interact with Earth later Day 3 (5th May) although further analysis is required. A further CME may have occurred due to the moderate flare at 03/0811 UTC but due to lack of imagery this has not yet been analysed.

Solar Wind / Geomagnetic Activity: The arrival of an unexpected CME (Coronal Mass Ejection) lead the solar wind speed to increase from background levels to become elevated, and for the strength of the magnetic field to increase from moderate to strong levels. The important north-south component become negative after arrival of the CME, reaching strongly negative values, before rotating back to positive from 02/1900UTC where it remained for the rest of the period. The resultant Geomagnetic activity was Unsettled (Kp 3) at first, then increased to reach G3/Strong (Kp 7) geomagnetic storm levels between 02/1500-2100 UTC, before falling to Quiet levels by 02/0300-0600.

Energetic Particles / Solar Radiation: Solar radiation was at background levels.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate to high solar activity is expected to continue with further M-flares expected and a chance of isolated strong flares, principally from AR3663 and AR3664. As these two regions are still on eastern side of the disc, the flare risk is maintained throughout the period.

Solar Wind / Geomagnetic Activity: Uncertainty due to the source of yesterdays CME (coronal mass ejection) gives a risk of a glancing blow through Day 1 (3rd May). Another significant CME from 01/0600 UTC could impact Earth late on Day 2 (4th May) or early on Day 3 (5th May). An Earth-directed CME from the X-class flare on 03/0222 UTC may affected Earth on Day 3 but required further analysis.

Coronal hole 33 could raise wind speeds later on Day 1, but more likely on Day 2, before declining through Day 4.

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Geomagnetic activity is expected to be Unsettled to Active (Kp 3-4), with a chance of G1/Minor storm intervals on Day 1. From late Day 2 through Day 3, G1/Minor to G2/Moderate (Kp5-Kp6) storm intervals are likely due to the expected CMEs and HSS, with a slight chance of G3 (Kp7) intervals from a combination of these events. By late Day 4, geomagnetic activity should decrease to quiet to unsettled levels.

Energetic Particles / Solar Radiation: Solar radiation is most likely to remain at background levels through this period. There is a slight chance for an S1/Minor Storm or greater event, should any proton-rich flares occur.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	40	60	60	30
Strong	G3	Yes	5	20	20	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	80	80	80	80
Very Active	R3 to R5 X	Yes	25	25	25	25

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	5	10
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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